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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,354	12/15/2003	Robert Oliver Buckingham	03485-P0009A	4073

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EXAMINER	
PILKINGTON, JAMES	
ART UNIT	PAPER NUMBER
3682	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,354	BUCKINGHAM ET AL.	
	Examiner	Art Unit	
	JAMES PILKINGTON	3682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 June 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6-10,12,13,15,17-26,28-33 and 37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6-10,12,13,15,17-26,28-33 and 37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Prosecution Application

The request filed on 6/5/08 for a Continued Examination (RCE) is accepted and a RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 2, 4, 5, 6-10, 12, 13, 15, 17-26, 28-33, 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stelle, USP 3,266,059, in view of Irwin et al, USP 3,504,902.

Re clm 1, Stelle discloses a link assembly for a robot arm comprising:

- A first set of first and second link members (75 and 76) each adapted for limited movement one with respect to the other
- A second set of third and fourth links members (77 and 78) each adapted for limited movement one with respect to the other
- Wherein the second member (76) abuts the third member (77)
- At least one wire (106 or 108) extending from said first link member to said second member, said at least one wire including a preload so as to maintain said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is

the cables that hold the joints together then the cables must be preloaded).

Stelle does not disclose a resilient elastomer disposed between said first and second members and between the third and fourth members and the elastomer is bonded to both of the first and second link members, and is maintained under compression.

Irwin teaches a resilient elastomer (C3/L43-53) bearing disposed between two members (11 and 12) and the elastomer is bonded to both of the first and second link members (bonded at faces 13 and 14) and is maintained under compression (disposed between two elements) for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling (C1/L62-65) thus providing the predictable result of stabilizing the robot arm.

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and second link members, and is sufficiently thin and maintained under compression, as taught by Irwin, for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling thus providing the predictable result of stabilizing the robot arm.

Re clm 2 and 9, Irwin discloses that the elastomer is made of plastic which is a synthetic rubber and/or a laminate (C3/L43-68).

Re clm 4, well a specific thickness is not disclosed by Irwin it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized a specific thickness range in order to conform to the compressional force inputs, and/or cost specifications of the assembly, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller, 105 USPQ 233.*

Re clm 6, Irwin discloses each surface of the elastomeric layer contiguous the member is secured (compressed between the members 11 and 12) so that in operation, relative movement between the members produces shear movement within the elastomer, the arrangement being such that the thinness of the layer reduces the tendency towards compression thereby imparting improved stability for the positioning of the components.

Re clm 7, Irwin discloses the elastomer means comprising a plurality of layers of elastomer (see Figures 3-8).

Re clm 8, Irwin discloses an interleaving rigid layer (17a-c and 20) is bonded to adjacent elastomer layers (16) to separate one layer from its neighbor (see Figures 6-8).

Re clm 10, Irwin discloses the interleaving layer (17a-c and 20) between each layer of elastomer (16) is of a material, which is bondable to or capable of being keyed to the elastomer (C3/L43-55).

Re clms 12 and 13, Irwin discloses that the interleaving layer comprises a metal layer, a resin layer, glass fiber, or a mat of either woven or unwoven material (C3/L43-55, Irwin discloses metal or plastic).

Re clm 15, Stelle discloses said at least one wire (106 or 108) comprises control means for controlling the movement (the wires are control means connected to a module) of said link assemblies within the segment.

Re clm 17, Stelle discloses that the control means comprises 3 wires (not shown in detail but Figure 5 shows multiple holes capable of receiving the wires also see C2/L48-50).

Re clm 18, Stelle discloses that the wires (106, 108) are tensioned to maintain the links under compression, the arrangement being such that application of differential tension between the wires causes or allows the segment to move or bend.

Re clm 19, Stelle in view of Irwin discloses that the first link member comprises an outer disc (98) having holes for control wires (Figures 5 and 6) and the second link member comprises an inner disk (88) which is adapted to be disposed generally inwardly of the outer disc (98) and which a central bore (94) which has a bore to accommodate at least one of control and power means (100) for the work head and a rubber disc layer (Irwin).

Re clm 20, Stelle discloses a plurality of said segments (75-80) in which control means is provide for each segment.

Re clm 21, Stelle discloses each segment terminates in an end cap having wire conduit means for the control wires of other segments of the arm and anchorage means

arcuately spaced about the cap for securing the control wires for the segment in question (Figure 6).

Re clm 22, Stelle discloses at least one of the members of each link is provided with means for guiding the wires from one end of the segment to the other (the holes).

Re clm 23, Stelle discloses each wire is disposed externally of the segment links and terminates in a ferrule (110, 112).

Re clm 24, Stelle discloses that each control wire is operated by an actuator (C3/L3-17).

Re clm 25, Stelle discloses each that each cable is provided with an actuator. Also, it would have been obvious to one of ordinary skill in the art at the time of the invention to pass the cables around pulleys to help align the cables before entering the segment.

Re clm 26, Stelle discloses each link is produced as a pair of half links which permit back to back assembly, the arrangement being such that an inner link (88) and an outer link (98) may be assembled with its associated bonding layer to form unitary link components (75-80), a plurality of which together can be assembled to form a segment.

Re clm 28, Stelle discloses locating dowels (rounded portion of 88) provided in mating holes (90).

Re clms 29 and 30, Stelle discloses an external sleeve (86) which is a bellows-type sheath (see Figure 4).

Re clm 31, Stelle discloses that the sleeve comprises a material and a configuration which is selected to increase the tortional stiffness of the arm (rib portions can only compress until the contact one another).

Re clms 32 and 33, the sleeve is capable of being filled with a lubricant.

Re clm 37, Stelle discloses a link assembly for a robot arm comprising:

- A first set of link members including:
  - A first member (75)
  - A third member (76)
  - Said first (75) and said third (76) members adapted for movement with respect to each other
- A second set of link members including:
  - A fourth member (77)
  - A sixth member (78)
  - Said fourth (77) and said sixth (78) members adapted for movement with respect to each other
- At least one wire (106 or 108) extending from said first member (75) to said sixth member (78) said at least one wire including a preload so as to maintain said link assembly under compression (Stelle states that all the joints are prestressed (C4/L37-52), if the joints are prestressed and it is the cables that hold the joints together then the cables must be preloaded).

- Wherein the first and third members (75 and 76) are configured in a cooperating mating relationship
- Wherein the fourth and sixth members (77 and 78) are configured in a cooperating mating relationship

Stelle does not disclose a resilient elastomer disposed between said first and third members and the fourth and sixth and the elastomer is bonded to both of the first and second link members and the fourth and sixth members, and is maintained under compression.

Irwin teaches a resilient elastomer (C3/L43-53) bearing disposed between two members (11 and 12) and the elastomer is bonded to both of the first and second link members (bonded at faces 13 and 14) and is maintained under compression (disposed between two elements) for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling (C1/L62-65) thus providing the predictable result of stabilizing the robot arm.

Upon the combination said adjacent spherical surfaces of said first, second and third link members (or fourth, fifth and sixth) are keyed or bonded to one another such that during articulation of the arm said third link (Irwin) rotates about a point of rotation relative to said first link and the distance between the spherical surfaces (88, 90) of said first and third links remains substantially constant; and said elastomeric material is maintained under compression by said at least one wire such that substantially no compressive deformation of said elastomeric material occurs during rotation.

It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the teachings of Stelle and provide a resilient elastomer bearing disposed between two members and the elastomer is bonded to both of the first and second link members and the fourth and sixth link member, and maintained under compression, as taught by Irwin, for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling thus providing the predictable result of stabilizing the robot arm.

Response to Arguments

3. Applicant's arguments filed 6/5/08 have been fully considered but they are not persuasive.

4. The Applicant argues that Irwin teaches away from an elastomer that is has "substantially no compressive movement).

Upon the combination of Stelle in view of Irwin the flexible joint would be between each link of Stelle. Stelle's robotic arm is held together by compression applied to the links by the springs. When a flexible joint member is inserted between two links that are held together by compression forces the flexible joint would also be held in a state of compression. Even though Irwin states that his flexible member can also extend does not mean it must extend and it is capable of being used in a compression environment.

The Applicant further supports the argument by stating that Irwin teaches that a flexible joint should allow for linear displacement and thus would not be held in a state of compression.

The Examiner turns to the independent claims where it states “the layer is maintained under compression by said at least one wire such that…no compressive movement as a result of the relative movement between the said first and said second (third) member." It is first noted that “substantially no compressive movement” only occurs when the invention is “maintained under compression” as recited in the claims. Second, inserting the elastomer of Irwin between the links of Stelle and applying the compressive load from the cables, as Steele does, would result in a device which meets the limitation when the device "is maintained under compression.” Upon removal of the load the device of Stelle in view of Irwin would indeed relax but any feature dealing with how the elastomer acts when not under a load is not found in the specification or the claims.

5. The Applicant asserts that the Examiner has not addressed every limitation nor provided a reason that would have prompted the skilled worker to arrange the device in such a manner.

First, the Applicant does not point to any particular structural limitation not accounted for, other then the present argument regarding the elastomeric ring which is addressed in the rejection and the arguments above. The Examiner has indeed addressed every structural limitation of the claim. Second, the reason provided by the

Examiner in this and the prior action as to why the skilled worker would combine the references is as follows: for the purpose of providing a flexible joint between two members that can accommodate lateral displacement as well as be stable against buckling thus providing the predictable result of stabilizing the robot arm.

6. The Applicant argues the structure of the elastomeric ring of Irwin and says it would not function when installed in Steele.

The Examiner does not understand the Applicant's perspective on how the resulting device would not function. It appears from the remarks on page 12, second full paragraph on the page, that this argument is focusing on Irwin having additional structure in the elastomer not required in the claims. This bearing would still function as claimed when reduced in size as argued prior. Additionally, the Examiner is not teaching removing the metal/plastic stabilizing ring from Irwin. The claims are written in an open ended fashion which does not limit the claim to just the structure recited. The elastomer being introduced to Steele is simply the ring of Irwin, nothing more or less, when held under compression by the cable of Steele the result will be substantially no compressive movement between the components.

7. The Applicant argues that the resulting combination would also result in the elastomer in the position of the springs and would not accommodate the spring.

This is not the case. The elastomer is being used in addition to the spring. In the assembled device of the combination the elastomer would be between the moving links

and bonded to the spherical ends of the links. The spherical mounting surfaces can be seen in both references (Irwin shows spherical, complementary surfaces at 13 and 14 as well). The spring would extend through the hole in the elastomer as shown in Figure 1 of Irwin. Thus, the only modification required in Steele in view of this combination is installing the elastomer between the links.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James Pilkington whose telephone number is (571) 272-5052. The examiner can normally be reached on Monday-Friday 8:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Ridley can be reached on (571) 272-6917. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. P./
Examiner, Art Unit 3682
7/1/08

/Richard WL Ridley/

Supervisory Patent Examiner, Art Unit 3682